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THE VELIGER

A New Species of *Helminthoglypta* (*Coyote*) (Gastropoda: Pulmonata) from the Tehachapi Mountains, California

by

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Abstract. A new species of helminthoglyptid land snail, *Helminthoglypta* (*Coyote*) ***concolor***, is described from the upper part of Tejon Canyon, Tehachapi Mountains, Kern County, California. It is similar to *Helminthoglypta* (*Coyote*) *isabella* from the Kern River drainage, and is the second known species of the subgenus *Coyote* from the San Joaquin Valley watershed. Fossils of *Helminthoglypta* sp., *cf. H.* (*Coyote*) *graniticola*, occur in the Cable Formation, lakebed deposits of probable Pliocene age in the Tehachapi Valley, 16 km north of the known range of *H. concolor*.

INTRODUCTION

Tejon Creek, Kern County, California, drains northwest from the Tehachapi Mountains into the San Joaquin Valley. In the 1950s and early 1960s, W. O. Gregg and W. B. Miller investigated the mollusks of the environs of Tejon Creek, finding three species of the land snail genus *Helminthoglypta*, one of them undescribed. In March 1987 the authors and W. B. Miller returned to the area to secure additional live material and add observations on distribution.

The vegetation of the Tejon Creek area is Blue Oak-Digger Pine Forest, grading upward into patches of Northern Jeffrey Pine Forest (KÜCHLER, 1977). Above approximately 1600 m elevation, White Fir, *Abies concolor* (Gord. & Glend.) Lindl., becomes a prominent component of the forest. Lower elevations are extensively overgrazed, and the principal snail cover is in Western Sycamore (*Platanus racemosa* Nutt.) and Fremont Cottonwood (*Populus fremontii* Wats.) deadfalls and debris piles close to Tejon Creek. Here were found *Helminthoglypta* (*Helminthoglypta*) *berryi* Hanna, 1916, and *Helminthoglypta* (*H.*) *avus* (Bartsch, 1916). In the zone of White Fir, a new species of the subgenus *Coyote*, described below, occurred sparingly under the bark of decaying fir deadfalls and in loose fir bark on the ground.

The following abbreviations are used: ANSP, Academy of Natural Sciences of Philadelphia; BR, senior author's collection, San Francisco, California; CAS, California Academy of Sciences geology localities; LACM, Natural History Museum of Los Angeles County; SBMNH, Santa Barbara Museum of Natural History; USNM, U.S. National Museum of Natural History; WBM, collection of W. B. Miller, Tucson, Arizona.

SYSTEMATICS

Family HELMINTHOGLYPTIDAE Pilsbry, 1939

Helminthoglypta Ancey, 1887

Type species: *Helix tudiculata* A. Binney, 1843, by original designation.

Subgenus *Coyote* Reeder and Roth, 1988

Type species: *Helminthoglypta* (*Coyote*) *taylori* Reeder and Roth, 1988, by original designation.

Helminthoglypta (*Coyote*) ***concolor*** Roth & Hochberg, sp. nov.

(Figures 1–4)

Diagnosis: A medium-sized *Helminthoglypta* with depressed, thin, broadly umbilicate shell sculptured with closely spaced, anastomosing growth rugae and regular papillation; whorl diameter increasing rapidly; prominent bulge at anterior end of upper, double-tubed chamber of

Explanation of Figures 1 to 3

Helminthoglypta ***concolor*** Roth & Hochberg, shell; holotype SBMNH 34947, top, apertural, and basal views. Diameter 23.1 mm.

penis, caused by thickening of walls of inner penial tube; broad penis-papilla present.

Description of shell of holotype: Shell (Figures 1–3) large for the subgenus, thin, translucent, of silky luster, strongly depressed, broadly umbilicate, umbilicus contained 7.7 times in major diameter. Spire barely elevated, whorl profile weakly convex, suture distinctly impressed. Embryonic whorls 1.8, narrower than first neanic whorl; initial half whorl smooth, thereafter with radiating rows of round to ovate papillae, grading after 0.25 whorl into irregular radial wrinkles. Early neanic whorls with low, narrow, closely spaced growth rugae, extremely fine radial wrinkling overall, and (most noticeably from third whorl on) minute, round, discrete papillae in obliquely descending rows. Growth rugae strong on later whorls, frequently anastomosing. Papillae becoming larger on subsequent whorls and elongated in direction of growth, many with depressed rim setting them off from wrinkled or pebbly background surface; an extra scattering of smaller papillae present just outboard of suture on later whorls. Papillae prominent on body whorl, continuing less densely over base into umbilicus. Base moderately inflated, tumid around umbilicus, surface between papillae smooth. Body whorl rapidly expanding, gently descending, not constricted behind lip. Aperture broadly auricular, oblique, plane of peristome at angle of 45° to vertical; lip weakly turned outward, not thickened, scarcely reflected except at columellar insertion. Upper limb of peristome produced and slightly downturned. Inner lip barely encroaching on umbilicus. Parietal callus thin, glossy, with papillae of parietal wall showing through. Shell pinkish tan under a yellowish-brown periostracum; with a 1.5-mm-wide russet spiral band on shoulder (prolonging trajectory of suture) with traces of narrower pale zones on either side of band. Diameter (exclusive of expanded lip) 23.1 mm, height 12.0 mm, width of umbilicus 3.0 mm, whorls 5.25.

Type material: Holotype: Santa Barbara Museum of Natural History, SBMNH 34947 (shell), CALIFORNIA: Kern County: Tejon Canyon, 16.5 km (10.3 road mi) E of cemetery [NE¼ sec. 30, T. 11 N, R. 15 W, San Bernardino Base and Meridian], elevation approximately 1600 m (5300 ft); in White Fir deadfalls. W. B. Miller, F. G. Hochberg, B. Roth coll., 7 March 1987.

Paratypes: SBMNH 34948 (7 shells); SBMNH 34950 (1 shell, stained whole mount of reproductive system, and whole mount of mantle), from same locality as holotype. Additional paratypes deposited in ANSP, BR, LACM, USNM, and WBM.

Referred material (all, CALIFORNIA: Kern County): South of sawmill at head of Tejon Canyon, elev. 1600 m [5300 ft], W. O. Gregg, W. B. Miller coll., 3–4 May 1958 (LACM 114645). Headwaters of Tejon Creek at sawmill 29.8 km [18.6 mi] up Tejon Canyon from Tejon Ranch headquarters, W. B. Miller coll., 3 May 1958 (WBM 2942).

Soft anatomy: The mantle over the lung is clear buff, heavily (50–60%) maculated with black. The reproductive system (Figure 4) is typical of the subgenus *Coyote* in having a prominent swelling at the anterior end of the upper, double-tubed chamber of the penis where it joins the lower, saccular chamber. This swelling is caused by a pronounced thickening of the walls of the inner penial tube. A short, broad penis-papilla projects into the lower, saccular chamber. Three low pilasters run the length of the lower chamber.

The epiphallic caecum is notably long, approximately 1.5 times the length of penis plus epiphallus. The penial retractor muscle inserts a short distance anterior to the summit of a crook in the epiphallus.

The atrial sac is longer than the vagina and relatively slender; it bears a rather small, ovate dart sac at its proximal end. The mucus gland bulbs are short and broad, joined by a slender common duct that inserts at the summit of the atrial sac. The spermathecal duct bears a very long diverticulum, approximately twice as long as the part of the spermathecal duct above the origin of the diverticulum.

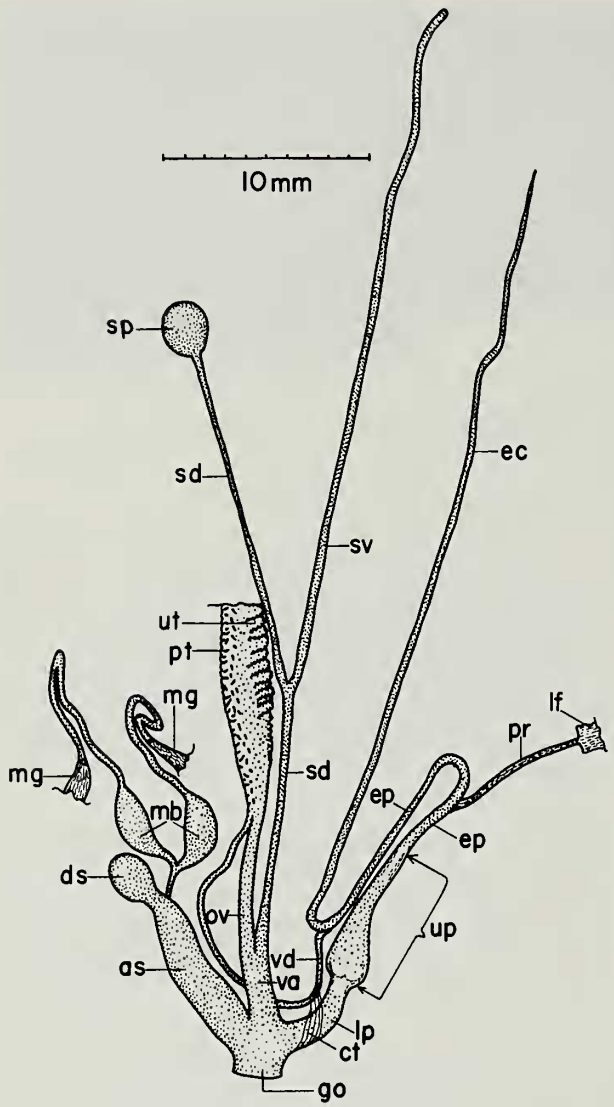

Figure 4

Helminthoglypta ***concolor,*** anterior portion of reproductive system drawn from projection of stained whole mount; paratype SBMNH 34950. Arrows indicate limits of double-tubed upper chamber of penis. Abbreviations: as, atrial sac; ct, connective tissue binding penis to vas deferens; ds, dart sac; ec, epiphallic caecum; ep, epiphallus; go, genital orifice; lf, piece of floor of lung at origin of penial retractor muscle; lp, lower chamber of penis; mb, mucus gland bulbs; mg, initial portion of mucus gland membranes; ov, oviduct; pr, penial retractor muscle; pt, prostate (part); sd, spermathecal duct; sp, spermatheca; sv, spermathecal diverticulum; up, upper chamber of penis; ut, uterus (part); va, vagina; vd, vas deferens.

Remarks: In the material at hand, adult shell diameter ranges from 18.6 to 23.1 mm (mean of 15 specimens including holotype, 20.5 mm); height, 9.4 to 12.0 mm ($\bar{x}$ = 10.9 mm); height/diameter ratio, 0.50 to 0.58 ($\bar{x}$ = 0.53); width of umbilicus 2.0 to 3.1 mm ($\bar{x}$ = 2.7); number of whorls, 4.7 to 5.3 ($\bar{x}$ = 5.0). The number of embryonic whorls ranges from 1.75 to 1.9.

On well-preserved shells, the papillae on at least the first three whorls are surmounted by minute periostracal setae. The holotype shows no traces of spiral sculpture, but the base of one paratype has faint incised grooves which interrupt the growth rugae, and a second paratype has minor traces of incised spiral lines on the first neanic whorl.

Helminthoglypta ***concolor*** is similar to *Helminthoglypta* (*Coyote*) *isabella* Berry, 1938, from near Lake Isabella in the drainage of the Kern River, Kern County. Both species have broad, flat shells with body whorls increasing in diameter more rapidly than in any other species of *Coyote*. *Helminthoglypta isabella* differs in having a slightly more elevated spire. The last quarter-turn of the body whorl descends farther and there is a tendency toward a faint supraperipheral angulation. The inner lip of *H. isabella* encroaches slightly more on the umbilicus than that of *H.* ***concolor***. The base of *H. isabella* is usually as densely papillose as the shoulder of the whorl; in *H.* ***concolor,*** the papillae usually become sparser on the base. The genitalia of both species are similar, but in *H. isabella* the common duct of the mucus glands is thicker-walled and the mucus bulbs less tumid; the anterior end of the upper chamber of the penis, while enlarged, is not as broadly swollen as in *H.* ***concolor***.

Helminthoglypta (*Helminthoglypta*) *piutensis* Willett, 1938, from the vicinity of Piute Mountain, Kern County, is also similar in shell shape but has the reproductive system anatomy of *Helminthoglypta, sensu stricto,* lacking the penis papilla and enlarged anterior end of the upper penial chamber. It was originally described as a subspecies of *Helminthoglypta* (*Rothelix*) *cuyamacensis* (Bartsch, 1916); Miller (1985) pointed out that it belongs to the typical subgenus and elevated it to the rank of species. The shell of *H. piutensis* has finer, more densely packed, more irregular papillation on the spire than *H.* ***concolor***. On parts of the body whorl the papillation gives way to short, low, irregular but mainly spirally directed ridges of periostracum. The surface between the papillae is densely wrinkled, producing a duller luster than that of *H.* ***concolor***.

Helminthoglypta isabella and *H.* ***concolor*** are the only species of the subgenus *Coyote* thus far described from the watershed of the San Joaquin Valley. All other species of the subgenus occur either on or around the fringes of the Mojave Desert or (*Helminthoglypta petricola* (Berry, 1916) and subspecies) in the mountains of San Bernardino, Los Angeles, Riverside, and Orange counties (Reeder & Roth, 1988). The distribution of the Mojave Desert species apparently reflects the ancient course of the Mojave River prior to the rise of the Transverse Ranges to their present elevation (Reeder & Roth, 1988). The ranges of *H.* ***concolor*** and *H. isabella* (or their common ancestor) also may have been within the Mojave River drainage before the uplift and westward tilting of the Sierra Nevada block displaced the San Joaquin/Mojave drainage divide eastward.

Before its main uplift, the Sierra Nevada was a broad ridge with summits of approximately 1000 m elevation (AXELROD, 1956, 1957). Although minor uplift took place as early as the Oligocene, the major elevation occurred in the late Tertiary (CHRISTENSEN, 1966; HAY, 1976; SLEMMONS *et al.*, 1979; HUBER, 1981) and the range did not exert a major effect on the distribution of vegetation until post-Pliocene time (AXELROD, 1962).

Fossil *Helminthoglypta* shells similar and possibly identical to the modern Mojave Desert species *Helminthoglypta* (*Coyote*) *graniticola* Berry, 1926, preserved in cherty limestones of the Cable Formation (of LAWSON, 1906) from 3.2 km north of Tehachapi (CAS 39352), 16 km north of the known range of *H.* ***concolor***, show that members of the subgenus *Coyote* were present in the area as early as the Pliocene. The Cable Formation consists of lacustrine rocks deposited before the formation of the present Tehachapi Valley, at a time when the main local drainage was from the north rather than northward as at present. Following orogeny of the Tehachapi Mountains, the headwaters of the former southward drainage were captured by erosion cutting back from the San Joaquin Valley into the upraised mountains (LAWSON, 1906).

Another fossil species, *Helminthoglypta* (*Coyote*) *alfi* Taylor, 1954, from the middle Miocene Barstow Formation, San Bernardino County, is located on the eastern edge of the modern range of the subgenus. It occurs in a molluscan assemblage indicating conditions more mesic than the highly arid Mojave Desert environment today.

It appears, therefore, that the distribution of the subgenus *Coyote*, including *Helminthoglypta* ***concolor***, antedates the present topography and the development of the diverse environments in which its component species now survive.

Etymology: L., ***concolor***, uniformly colored—alluding to the White Fir, *Abies concolor*, prominent at the type locality. All observations of *Helminthoglypta* ***concolor*** thus far have been in direct association with fir logs or bark on the ground.

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